APPENDIX D

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PRELIMINARY OUTLINE FOR OFFSHORE ECOLOGICAL DAMAGE ASSESEMENT STUDIES

Studies Relative to the Fate of Spilled Oil on the State Submerged Lands, Utilizing Baseline Data Collected from 1975 through 1977 for Coastal Zone Management

Submitted by:

Bureau of Economic Geology

The University of Texas at Austin

In cooperation with:

The U. S. Geological Survey and

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Preliminary Proposal for

DAMAGE ASSESSMENT OF THE 1979 GULF OF MEXICO OIL SPILL

Introduction

The purpose of this proposed work is to assess any damage of the 1979 Gulf of Mexico Oil Spill impacting State Submerged Lands. State Submerged Lands include all estuarine and bay lands as well as the Gulf of Mexico shelf from the beach to three leagues (approximately 11 miles). This preliminary proposal supplements that submitted by the U. S. Geological Survey and Texas Marine Science Institute.

The Baseline

An extensive program of sampling State Waters was included in the Texas Coastal Zone Management Program when directed by the General Land Office of Texas. Therefore a data base, valuable for damage assessment from any adverse impact, has already been collected for State Submerged Lands as reported by McGowen and Morton (1979). The data base collected in 1975-1977 includes clamshell samples from the submarine bottom on one mile centers (nearly 6700 samples in all). These samples were and are being studied for sediment type, textural analyses, multielement (30) geochemical analyses, and biological analyses. Biological analyses include identification of all molluscs, crustaceans, and worms; marine flora as well as foraminifers in Laguna Madre are under separate study. Live and dead organisms

are studied in all cases. In addition, geophysical data support the bottom sampling.

Completed studies include: sediment types for the entire area; textural analyses of all but Port Lavaca, Port O'Connor and the Beaumont-Port Arthur sheets; biological analyses of the Corpus Christi (100%) and Houston-Galveston (85%) sheets; geochemical analyses of the bays; and geophysical analyses of the shelf. Damage assessment will require the supplementation of completed analyses with further analyses of the samples from the data base that are not yet analyzed.

Damage Assessment

Most damage to State Submerged Lands will be observed in the benthic biologic population. These damages may include direct short-term effects such as the rapid destruction of bottom dwelling organisms from contact with toxic hydrocarbons. Another order of damage may relate to long-term toxicity of residues, either imparing organisms or preventing the reoccupation of normal ecologic niches. A part of this toxicity can be derived from inorganic components of the spill residua identified as trace elements. The bottom dwelling population in the data base indicates the health of a vital food chain which impacts both commercial and sport fishing. Whereas the damage to tourism may be short term, the damage to food gathering on the Texas coast might have long-term impacts.

The advantage of a recent data base already under study leads to a quantitative assessment of the effects of the spill. Ratios of living to dead organisms before and after the spill can be assessed. The quantitative data can be estimated in dollars, especially for

commercial molluscs (oysters) and cretaceans (shrimp and crabs).

Quantitative data also contribute to planning for the longevity of damages. For example, a rate of recovery of organisms returning to normal sites can be used to predict how much commercial (and sport) fishing may be appropriate in the future. An analogy is overgrazing and planned pasture control for cattle and sheep.

These same quantitative data, collected for Coastal Zone Management, have many applications in addition to assessing oil spill damage. These data impact (1) pipeline construction for collection and distribution of oil and gas, (2) dredging for coastwise as well as potential deep port channels, (3) disposal of spoil, (4) monitoring of marshes, (5) beach engineering, and others. From the same data base, effects of natural catastrophes such as hurricanes can also be monitored for economic impacts on natural systems.

The Texas Coastal Zone Management program was implemented through the General Land Office of Texas from 1975-1978. Policy guidance was provided by the Interagency Council for Natural Resources (ICNRE), whose composition is shown in Table 1. A successor interagency group named the Natural Resources Council became the policy group by statute in 1977. In late 1978, the Governor of Texas reassigned all responsibility for the Coastal Zone Management Program to the Natural Resources Council. The 1979 legislature has reformulated that body into a group named the Texas Energy and Natural Resources Advisory Council (TENRAC), effective September 1, 1979. The TENRAC members are dominated by natural resource agencies of the old ICNRE, and the council is co-chaired by the Governor and Lieutenant Governor.

Identification of Studies and Users

1. Name of Study

Integrated studies of the fate of hydrocarbons relative to sediment transport, benthic infaunal communities and trace chemistry of the upper benthic sediment column, Texas Submerged Lands.

* Users: (1) State and Federal agencies, municipalities, and other local governmental units, especially those having mandated regulatory responsibilities and those supplying public services likely to be impacted, such as parks and recreational facilities; (2) shrimp and fishing industries; (3) tourist and recreational industries; (4) oil and gas industries; (5) international bodies concerned with laws of the sea; (6) concerned members of the public; (7) civic groups; and (8) congressional oversight committees and judicial authorities concerned with damage assessment.

2. Where

Offshore to three leagues and in the bay-estuarine systems in both short and long-term context for direct comparison to baseline data and to establish a predictive timeframe for the ultimate fate and effect of oil released in a major spill that becomes regionally distributed. The work should be coordinated closely with similar studies to be done in the surf zone and on the adjacent beach sectors. The need for such coordination is especially emphasized.

3. When

To begin soon after shutdown of flow from the IXTOC-1 well has been completed. Tentatively an initial cruise should be scheduled for mid-November, occupying, for sampling purposes, stations along Bureau of Economic Geology transects which best complete baseline study. Each of these transects gave what might be called subprovince characterizations that would be expected to give good indications of stress from any pollution by the oil. A follow-up cruise would be made in March 1980, and again some time in the period May to September, depending on information gathered in the two earlier cruises. Continuation and frequency of cruises in years 2 and possibly 3 would depend on evaluation of the results as the study progresses.

Study Outline

The study would include reoccupation of the sites reported by McGowen and Morton (1979) in the same time frame reported in the U. S. Geological Survey Proposal. The benthic sediments would be sampled for relating post-spill conditions to the baseline data to determine the degree to which oil eventually becomes incorporated into the sediments and to determine the ultimate influence of oil in sediments and biota. The shelf sediments out to three leagues would be sampled by the team collecting the U. S. Geological Survey samples. The Bureau of Economic Geology would sample the bays along the same (or appropriate) transects.

The samples would then be analyzed in laboratories for textural, inorganic geochemical, and biological properties.

Budget

An estimated budget from which to pursue the monitoring of the impact of the 1979 Summer Oil Spill on the Texas Coast is shown in Table 2. Shown are high and low figures if one or three bays are studied along with the four passes. Shelf sample spacing is 50 lines (the BLM number) at two (2) mile intervals for the Low estimate; spacing is 100 lines at two (2) mile intervals or 50 lines at one (1) mile intervals for the High estimate plus denser sampling near the passes. Basic biologic descriptions require about four (4) man days per sample; whereas, the descriptions of later samples taken during four (4) seasons for two (2) years take one (1) man day. It is possible to expand or compress the program with these basic assumptions. You should also be aware that The University indirect costs are included in this budget.

The Bureau of Economic Geology will contribute more than 10 percent of the project costs. These costs include administration, textural analyses and one-third the geochemical analyses. The latter analytical costs are based on costs per sample established by two years of analyses.

Reference

McGowen, J.H. and Morton, R.A., 1979, Submerged Lands of Texas, sediment distribution, bathymetry, faults and salt diapirs; The Univ. Texas, Bur. Econ. Geol., Special Report, 47 p., 7 maps.

Table 1. Interagency Council for Natural Resources and Environment.

Department of Agriculture	
Air Control Board	
Bureau of Economic Geology	
Forestry Department	
General Land Office	
* Department of Health Resources	
* Department of Highways	
Historical Commission	
Departments of Parks and Wildlife	
Railroad Commission	
Department of Soil Conservation	
* Water Development Board	Water Resources
* Department of Water Quality	Water Resources
* Department of Water Rights	Water Resources

* By legislative statute some names are modified and the water agencies combined.

TABLE 2

ESTIMATED BUDGET TO MEASURE IMPACT OF

1979 SUMMER OIL SPILL ON TEXAS SUBMERGED LANDS

		HIGH	LOW
1.	SHELF BIOLOGY	$326,984	$171,012
	Base description	$653,964	$342,024
	8 Seasons description		
2.	SHELF SEDIMENTOLOGY	$ 6,250	$ 2,500
	8 trips =	$ 50,000	$ 20,000
3.	SHELF GEOCHEMISTRY/trip		
	Inorganic (30 trace elements)	$ 19,200	$ 10,200
	8 trips =	$153,640	$ 86,600
4.	BAY SAMPLING/bay/trip	140 samples	80 samples
	Air Boat Rental	$3,000	$1,750
	People	$1,250	750
		$4,250	$2,500
	8 trips =	$34,000	$20,000
	3 bays =	$102,000	$60,000
5.	BAY BIOLOGY/per bay		
	Base description	$70,427	$40,244
	8 Seasonal descriptions	$140,848	$80,488
		$211,281	$120,732
	3 bays =	$633,843	$362,196
6.	BAY BEOCHEMISTRY/bay/trip		
	Inorganic (30 trace elements)	$4,200	$2,400
	8 trips =	$33,600	$19,200
	3 bays =	$100,800	$57,600
7.	BAY SEDIMENTOLOGY	$6,250	$2,500
	8 trips =	$50,000	$20,000
8.	TRAVEL/per trip	$8,000	$4,000
	8 trips =	$64,000	$32,000
9.	EXPENDABLES/per yr.	$10,000	$5,000
10.	EQUIPMENT/one cost	$120,000	$70,000

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PRELIMINARY OUTLINE FOR OFFSHORE ECOLOGICAL DAMAGE ASSESSMENT STUDIES

Offshore Studies Relative to the Fate of Spilled Oil in the Nepheloid Layer and Bottom Sediments, Utilizing Baseline Data Collected from 1974 through 1977 on the South Texas OCS

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In conjunction with:

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INTRODUCTION

From 1974 through 1977, the U. S. Geological Survey through the field office in Corpus Christi, Texas, participated in a regional baseline study of the South Texas OCS, the region that has received the initial impact of the IXTOC-1 oil in U. S. waters. The general work plan outlined herein is presented with the understanding that the U. S. Geological Survey group in Corpus Christi will join investigators from the University of Texas Marine Science Laboratory at Port Aransas as a scientific team in carrying out integrated studies. These studies also should be integrated with those of the Texas Bureau of Economic Geology and likely with Texas A&M University as well.

The Baseline

Personnel from the U. S. Geological Survey group at Corpus Christi, as participants in the 4 years of baseline environmental studies on the STOCS sponsored by the Bureau of Land Management, collected samples from 264 stations spread regionally over the STOCS for a variety of geological and geochemical studies: sediment texture of benthic sediments, amounts of infaunal bioturbation over the region as an aspect of regional sedimentation; chemical analyses to measure rates of sedimentation; trace metals chemistry of benthic sediments, radiography of benthic sediments; and the texture, chemistry and amounts of suspended matter in the water column synoptically on a seasonal basis with emphasis on the nepheloid layer. In addition and as a part of the biological and hydrocarbon chemistry studies

being made by UT, Port Aransas, the U. S. Geological Survey did the textural analysis and trace metals chemistry for all samples collected seasonally, and in some cases monthly, by UT along the master monitoring transects used for the baseline studies. All of these data are available in reports prepared for each year of study and are summarized along with related aspects of data in a series of Atlas Maps. The work recommended would closely utilize the baseline information available. As part of the studies sponsored by the Bureau of Land Management, Texas A&M University concentrated on the string of reefs on the outer shelf and the surrounding nepheloid layer. Personnel from USGS participated in some of those cruises. The USGS and the Bureau of Economic Geology cooperated in collection of data in State waters.

Identification of Studies and Users

1. Name of Study

Integrated studies of the fate of hydrocarbons relative to sediment transport, benthic infaunal communities and trace chemistry of the water and upper benthic sediment column, South Texas offshore.

* Users: (1) State and Federal agencies, municipalities, and other local governmental units, especially those having mandated regulatory responsibilities and those supplying public services likely to be impacted, such as parks and recreational facilities; (2) shrimp and fishing industries; (3) tourist and recreational industries; (4) oil and gas

industries; (5) international bodies concerned with laws of the sea; (6) concerned members of the public; (7) civic groups; and (8) congressional oversight committees and judicial authorities concerned with damage assessment.

2. Where

Offshore in both short and long-term context for direct comparison to baseline data and to establish a predictive timeframe for the ultimate fate and effect of oil released in a major spill that becomes regionally distributed. The work should be coordinated closely with similar studies to be done in the surf zone and on the adjacent beach sectors. The need for such coordination is especially emphasized.

3. When

To begin soon after shutdown of flow from the IXTOC-1 well has been completed. Tentatively an initial cruise should be scheduled for mid-November, occupying, for sampling purposes, stations along transects II and III of the STOC baseline study. Each of these transects gave what might be called subprovince characterizations that would be expected to give good indications of stress from any pollution by the oil. A follow-up cruise would be made in March 1980, and again some time in the period May to September, depending

on information gathered in the two earlier cruises. Continuation and frequency of cruises in years 2 and possibly 3 would depend on evaluation of the results as the study progresses.

Study Outline

The components of study would include a release of sea drifters, surface and bottom, from a light aircraft to confirm the water circulation data used for the baseline centroid projections shown in Berryhill and others, 1976, and to document the change in flow regime to the south after October when oil in the water should begin moving southward.

The nepheloid layer would be sampled and analyzed both chemically and texturally. The rationale for studies on the nepheloid layer and the upper sediment column is that all hydrocarbons that do not evaporate become either adhered to clay minerals and organic particles or coagulate. In both cases, the hydrocarbons end up at the surface of the seafloor from where the infauna works it into the upper sediments. The infauna is highly critical in the food chain as it relates to species of commercial interest and consequently the endangered species. Comparison of the infauna activity in polluted sediment with the baseline data will provide direct answers to the "users" about the long-term impact of this IXTOC-1 oil spill. USGS would make both texture and trace metals determinations of the inorganic constituents in the nepheloid layer. As a part of the study, the water column would be sampled at mid-depth

and near surface as a part of defining the extent, and thickness and chemistry of the nepheloid zone relative to the general water column. The special characteristics of the nepheloid layer may delay the transfer of hydrocarbons to the benthic sediments because of the affinity of the clay minerals in the layer.

The benthic sediments would be sampled for relating post-spill conditions to the baseline data to determine the degree to which oil eventually becomes incorporated into the sediments and to determine the ultimate fate of the oil in the sediments. The relation of oil to the sediments would emphasize the role of the infauna in working the oil into the sediments whence it enters the food chain; otherwise, studies would include the same studies made for the baseline.

Sampling would begin with reoccupation of stations along transects II and III and would be extended to other baseline stations as needed to provide sufficient coverage, and as indicated by results as the study progresses. After sampling at each station, skimming trawls would be made over the sample site and outward some one-fourth mile to determine the degree of tar ball concentration.

* The integrated summary and atlas (Berryhill and others, 1976) contains a very accurate prediction of the path and landfall of the oil along the Texas coast.

General Budget Request (yearly)

-- Operational expenses and salaries of support personnel	$ 60,000
-- Ship time	$ 30,000
	$ 90,000
Bureau overhead	$ 10,000
(Cost of a 3-year effort would be ∿ $300,000)	$100,000

Contribution to the study by USGS (yearly)

-- Professional Salaries	$ 30,000
-- Use of laboratories and equipment	18,000
-- General supplies, services and overhead support by USGS	12,000
-- Salary support by persons not covered by requested budget	22,000
Total	$ 82,000

The general plan presented is considered part of a team effort to include the University of Texas (both the Bureau of Economic Geology and the Marine Science Laboratory at Port Aransas) and possibly Texas A&M University. Furthermore, it is assumed that it will be closely coordinated with both the beach profile work and the work in the surf zone. Work along traverses involving the three groups should be considered a total team effort.

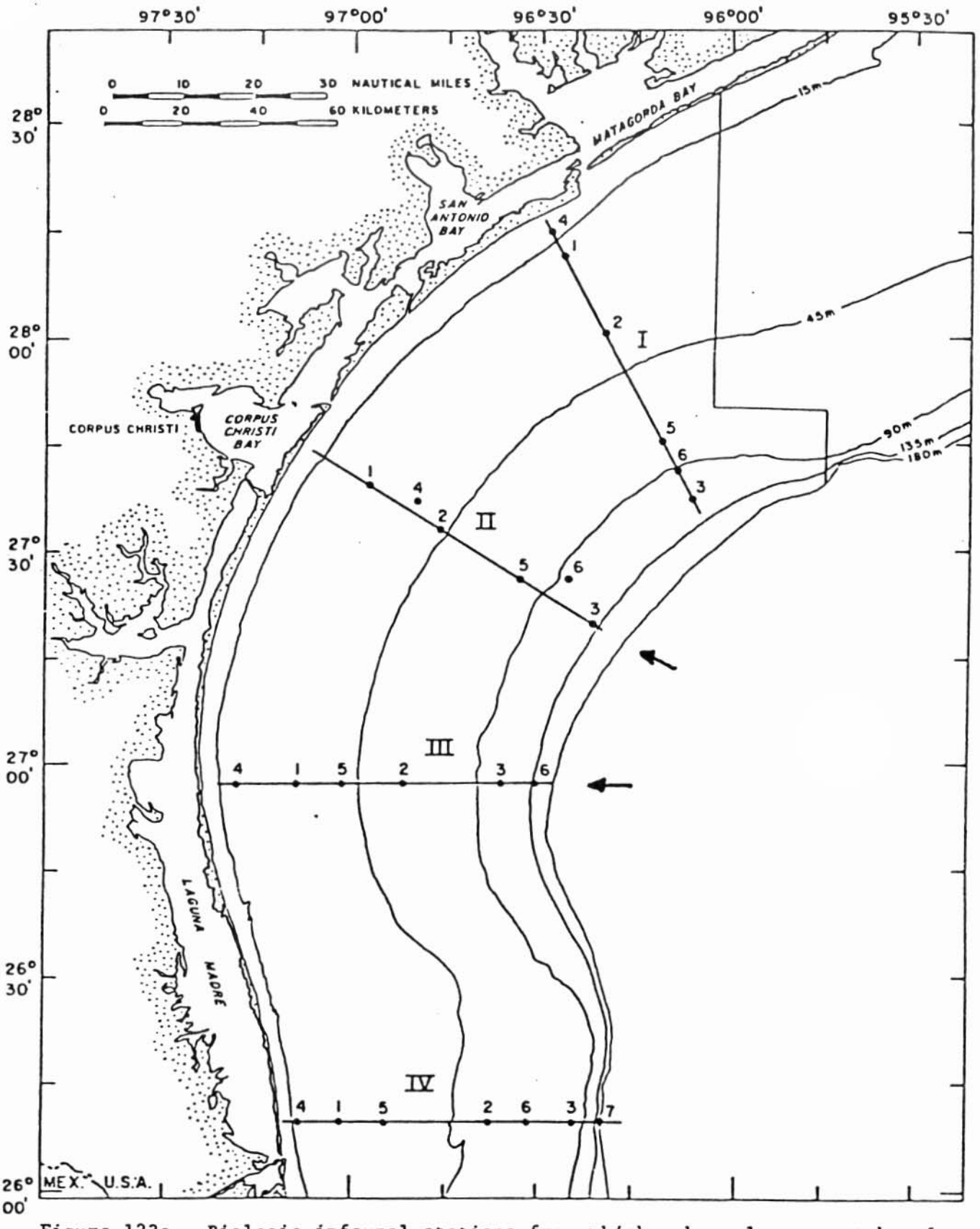

Figure 123a. Biologic infaunal stations from which subsamples were taken for trace metal analyses.